# **Portraying the Earth**

## **Chapter 2**

# **The Nature of Maps**

## How and why do we describe the earth using maps?

## When we need **to understand the world** around us we use maps

## A map is a **two or three-dimensional representation** of the Earth and a **spatial distribution of selected phenomena**– normally the components of a landscape.

## The **basic attributes** of a map

### Show **direction, distance, size, and shape**

#### **Spatial relationships of features** of the earth

## Maps have a special purpose

# **Map Scale**

## **The scale of a map gives the relationship between length measured on the map and corresponding actual distance on the ground**.

## **Scale types**

### ***Graphic Map Scale*** uses **a line marked off in graduated distances**.

### ***Fractional Map Scale*** compares map distance with ground distance in a proportional fraction or ratio called a **representative fraction.**

### ***Verbal Map Scale* or *word scale,*** state **in words** the ratio of the map scale length to the actual distance on the Earth’s surface.

# **Large Scale and Small Scale**

## **Large Scale Maps**

### Large representative fraction or the **denominator is small. 1:10,000**

### See **more detail** in the map

### Portrays a **smaller area** of the earth

## **Small Scale Maps**

### Small representative fraction, or the **denominator is large,** 1:1,000,000

### See **less detail** in the map

### Portrays a **large area** of the earth

# **Map Essentials - Components of a Map**

## **Title**: short brief summary of map’s contents

## **Date**: should be the date of the compilation of the data found on the map.

### Can also be the date of the data found on the map

## **Legend**: information about the symbols colors, and such used to depict the features of the map

## **Scale**: if map is more than a pictogram. Scale can be either graphic, verbal, for fractional.

## **Direction: a north arrow** (top of the map, should be north). If there is a grid, there should still be a north arrow.

## **Location:** grid, such as latitude and longitude, to be used to locate features

## **Data Source**: source of the data found on the map

## **Projection type**: in what projection is the data on the map

# **Globes**

## **Best substitute** for depicting the earth

## The only thing changed in depicting the earth onto a globe is the **size**

## Shows comparative **distances, sizes, and accurate directions**

## **Represents without distortion**, the spatial relationships of features of the earth

## **Problem, because the globe will be set a very small scale** (detail is lost)

# **Map Projections**

## A system whereby the **spherical surface of the earth is transformed to display on a flat surface**

## **Three basic projection styles** for the earth

### **Cylinder**

### **Cone**

### **Flat or Planar or Tangent**

## Using a globe inside the Earth with each style, the lines or features are transferred to the paper

# **Equivalence versus Conformity**

## **Equivalence Projection** – **equal area projection**

### The **size ratio of any area on the map to the corresponding area on the ground** is the same all over the map

### **Desirable because misleading impressions are avoided.**

### **Difficulty to achieve on small-scale maps**, to maintain proper areal relationships

## **Conformal Projection – conformal relations**

### Proper angular relationships are maintained so that the **shape of something on the map is the same as its shape on the Earth**

### **Meridians and Parallels cross each other at right angles**.

### Most notable projection is probably the ***Mercator* projection**.

### A ***Robinson* projection** is a compromise between a equivalence and conformality

## **Mercator**, the most famous Projection

### Developed in 1569 by Flemish geography and cartographer, **Gerhardus Mercator**

### Developed for **use in navigation of ships**

### Advantage: shows***Loxodromic*** *or* ***Rhumb lines*** as straight lines.

### **Problems with the Mercator**,

#### **Extreme East-West distortion in higher latitudes**

#### To compensate **Mercator stretched the spacing** north and south to compensate.

#### Allowed shapes to **be reasonably accurate but proper size relationships distorted**

## **Plane projection – *azimuthal or zenithal projection***

### Obtained by **projecting markings of the globe on a flat piece of paper that is tangent** to one point of the globe

### **Used often in large scale maps** or small areas of the globes

### **Usually is shown from either the North Pole or the South Pole**

## **Conic Projection**

### Obtained by **projecting the markings of the globe onto a cone wrapped tangent to or intersecting a portion of the globe**

### Normally the **apex of the cone is positioned about a pole** which means the circle of tangency coincides with a parallel.

### Best suited for regions of **east-west orientation in the mid latitudes**

# **Funky Projections**

## **Pseudo-cylindrical projection** – elliptical or oval projection

### Football shape of usually the whole world

## **Interrupted projections**

### Most famous – ***Goode’s interrupted homolosine projection***

# **Computer Cartography**

## Using **computers to create maps**

### **Symap** (first software used to make maps

#### **1965**

### **Global Positioning Systems**

### **Remote Sensing**

### **Imagery**

### **Multi-spectral Remote Sensing**

### **Geographic Information Systems**

## Widely used today

## Expanding industry

# **Isolines**

## **Portray the spatial distribution of some phenomenon on the earth**

### **Isarithm, isogram, isopleth, and isometric lines** are synonymous for our purposes

### Most important to physical geography

#### **Elevation Contour Line** – depicts elevation

#### **Isotherm** – depicts equal temperature

#### **Isobar** – depicts equal atmospheric pressure

#### **Isohyet** – depicts equal quantities of precipitation

#### **Isogonic Line** – depicts equal magnetic declination

# **Characteristics of Isolines**

## **Always closed lines-** is line comes to the end of a map the line probably proceeds to the next area

## Represent **gradations in quantity, never touch or cross one another**

## **Numerical difference** between one isoline and another **is an interval**

## Isolines **close together indicate a steep gradient, those far apart indicate a gentle gradient**

# **Global Positioning System (GPS)**

## A **satellite based system for determining** accurate **positions** on or near the Earth’s surface.

## **Developed in the 1970’s** for the military

## Based on **24 high-altitude satellites** configured so that a **minimum of 4 satellites** are in view of any position on the Earth

## Each **satellite continuously transmits both identification and positioning information** that can be picked up by receivers on Earth.

## **Position determined through triangulation**

# **Remote Sensing**

## **Any measurement or acquisition of information by a recording devise that is not in physical contact with the object under study-in this case the Earth**

### **Satellite remote sensing**

#### Imagery obtained from geosynchronous orbit satellites.

### **Aerial Photographs**

#### Photographs taken from an elevated platform, such as a balloon, airplane, or rocket

#### Photographs classified either oblique or vertical

# **Multi-spectral Remote Sensing**

## **Multi-spectral or Multi-band** – different regions of the electromagnetic spectrum

### Landsat imagery

#### Launched in the 1970’s and 1980’s

##### Four spectral bands

## **Earth Observing System** (EOS)

### Moderate Resolution Imagery Spectroradiometer (MODIS)

#### 36 spectral bands

## **Radar and Sonar Sensing**

# **Imagery**

## **Orthophoto Maps** – multicolored, distortion-free photographic image maps

### All displacement caused by camera tilt or differences is removed.

### Shows greater detail than a conventional map but retains the characteristic of a map

## **Color or Near Infrared Imagery**

### Refers to the visible-light region of the electromagnetic spectrum

### Near Infrared Color is used to depict vegetation

## **Thermal Infrared Sensing** – depicts temperature

# **Geographic Information Systems (GIS)**

## Automated system for **the capture, storage, retrieval, analysis, and display** of spatial data

## A GIS can **manipulate rows and columns of tabular and links it to the spatial features** it represents.

## **All the features depicted in the GIS have a coordinate system that ties them to a coordinate system of the earth**

### Knows where it is on the earth’s surface

## Allows for the **many layers of different features to be over-laid to form maps** that can be used to make decisions